Collision tumor: Case report and literature review

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Introduction

• The term ‘collision’ has been used for the cases in which two tumors are being intermixed or appear close to each other without brain tissue.

• In the literature, there are only approximately 50 reports of intracranial collision tumors most of them describe cases with collision tumors consisting of malignant astrocytoma (including glioblastoma) and meningioma.

• It also encompasses cancer-to-cancer (or tumor-to-tumor) metastasis, where a primary tumor receives a metastatic tumor from another location.

• A true collision tumor represents a coexistence of two adjacent but histologically different malignant neoplasm's occurring in the same organ without histological admixture or an intermediate cell population zone.
Case report

A female 75-years-old-patient, started symptoms of mental confusion, spice and spatial disorientation, loss of memory, psychomotor agitation, intense headache, and aphasia.

At this time, her brain magnetic resonance imaging (MRI) showed a large peripheral lesion in the left frontal lobe, hypercellular, with bleeding inside, necrotic center, and important edema and expansive effect (Figure 1).
Case report

The supposed extra-axial lesion, in left frontal convexity, shows hypo/isointense signal on T1 and heterogeneous hypersignal in T2 and T2-FLAIR-weighted images. There are also a marked edema, a noticeable expansive effect and a dural thickening of intense contrast enhancement with suspicious dural tail signal. It appears to be very hypercellular containing with a necrotic center. Note that it has a linear peripheral contrast reinforcement and multiple hematic residues inside and on its edges (low signal on SWI).

Figure 1. Brain magnetic resonance imaging findings.
A) Axial non-contrasted T1-weighted image (T1WI), B) Axial contrasted T1WI image, C) Axial T2-Flair image (T2WI), D) Diffusion-weighted imaging (DWI), E) Apparent diffusion coefficient (ADC) map, F) Susceptibility-weighted images (SWI).
Case report

The patient was submitted to a craniotomy for the excision of the tumor and the antomapathological findings were compatible with Meningeoma (grade I, OMS) and Glioblastoma (grade IV, OMS) (Figures 2, 3).

She was treated over 32 weeks according to the standard Stupp’s protocol for Glioblastoma (radiotherapy plus concomitant and adjuvant Temozolomide) and until to the 10-month-follow-up the patient had no recurrence.
Case report - Histopathological findings.

**Fig. 2. Meningothelial meningeoma.**

A) Fragment of tissue showing moderately cellular proliferation of spindle cells, in cohesive storiform, fasciculated or whorling arrangement (HE, 100x), B) The cells show regular and monotonous normochromatric nuclei with pinpoint nucleoli and syncytial pattern of growth (HE, 400x), C) and D) Immunohistochemical study showing EMA positivity and GFAP negativity (40x).

**Figure 3. Glioblastoma (HE, 100x).**

(*) Necrotic areas
(**) Microvascular proliferation with endothelial reactivity.
Case report - Immunohistochemical findings.

<table>
<thead>
<tr>
<th>Stain</th>
<th>Results</th>
<th>Characteristics</th>
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<tr>
<td>S100</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>RP</td>
<td>Positive</td>
<td>80-90% (Strong)</td>
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<tr>
<td>GFAP</td>
<td>Negative</td>
<td>(doubtful)</td>
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<tr>
<td>TFE3</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>EMA</td>
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<td>Most</td>
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<tr>
<td>HMB45</td>
<td>Negative</td>
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<td>Ki67</td>
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Discussion

- Without special or unique clinical features, collision tumors are difficult to diagnose preoperatively; **pathological identification of the dual components is often the only way to ensure a correct diagnosis.**
- The pathological examination **including immunohistochemical profile** still supports this unique diagnosis
Discussion

- The observation that a significant number of the reported cases had their tumoral localization in juxtaposition raises the possibility that one tumor may influence as an irritating agent for the local proliferation and growth of the other. Surgical trauma, genetic factors and ionizing radiation may act as factors for tumor development.

- Glioma may develop due to neoplastic transformation of the reactive glial cells surrounding a meningioma. The most suspected substance is platelet-derived growth factor subunit which is the main receptor in astrocytoma. Astrocytoma growth is probably stimulated by PDGF in an autocrine mechanism. It is possible to develop meningioma as secondary malignant neoplasm due to transformation of the arachnoid cells in response to the growth of a subjacent glioma or after radiation therapy.
Discussion

• Although conventional anatomic MR imaging provides excellent soft-tissue resolution, many intracranial pathologies share similar MR features, making a definitive diagnosis difficult.

• To overcome this lack of specificity, physiology-based neuroimaging methods have emerged that reflect the in vivo physiologic parameters, which may allow for better differentiation.

• The parametric MRI (pMRI) relies on hemodynamic differences in microvasculature to discriminate between unique tissue types. On the T2* susceptibility signal intensity-time curve, tissues with greater microvascular attenuation show larger T2* signal intensity drops, while capillaries with greater permeability show incomplete T2* signal intensity recovery.

• This difference in capillary attenuation is consistent with our pMRI findings, which showed a greater T2* maximal signal intensity drop, and therefore a greater relative cerebral blood volume (rCBV), for the meningioma than the metastasis.
Summary points

• Collision tumors are difficult to diagnose preoperatively; The pathological examination including immunohistochemical profile still are the base of diagnosis.

• Nearly all intracranial collision tumors have eluded preoperative radiologic diagnosis and were only discovered incidentally during postoperative pathologic examination.

• In the literature, there are only approximately 50 reports of intracranial collision tumors most of them describe cases with collision tumors consisting of malignant astrocytoma (including glioblastoma) and meningioma.

• Physiology-based neuroimaging methods have emerged that reflect the in vivo physiologic parameters, which may allow for better differentiation.